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ASSETS AND THREATS TO *Molinia* MEADOWS (*Molinion caeruleae* ALLIANCE) ON CHOSEN NATURA 2000 AREAS IN THE EASTERN PART OF THE SILESIAN UPLAND

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Abstract. The studies on diversity and conservation status of *Molinia* meadows as significantly endangered natural habitats are very important in the context of nature protection on the European scale. The collected basic data for exemplary protected objects in the Silesian Upland, whose main subject of protection is the already mentioned natural habitat, provide basis for continuing monitoring and for drawing conclusions concerning their protection. This was the main aim of the undertaken research. Occurrence of the *Galio veri-Molinietum* and the *Selino carvifoliae-Molinietum caeruleae* associations from the *Molinion caeruleae* alliance were observed on the analyzed areas. The most important floristic assets of these areas include occurrence of a significant number of 5 plant species under strict protection as well as occurrence of *Laserpitium prutenicum* regarded as critically endangered on the areas of the Silesian Voivodeship. Communities on the designated Natura 2000 areas of "Meadows in Jaworzno" above all are endangered by natural processes (plant succession), while the area of "Meadows in Sławków" by human activities connected with amelioration and development as well as devastation of the area by off-road vehicles. Significance of the areas designated for protection in preserving valuable phytocenotic structures has been highlighted, especially in the aspect of their location on urban areas.

Key words: endangered habitats, meadow communities, "Meadows in Jaworzno", "Meadows in Sławków", non-forest vegetation, Silesian Voivodeship

INTRODUCTION

In Europe, after the end of the II World War, shift in agricultural management from extensive into intensive, caused significant transformation of habitats and depletion of

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agrocenoses [Robinson and Sutherland 2002, Poptcheva *et al*. 2009]. Therefore, a very important task of biodiversity protection is on one hand determination of the current status of habitats and plant communities on areas utilized in agriculture, and on the other hand monitoring them. Owing to this, type of changes may be precisely determined, as well as their scale and trends. Significance of monitoring species and natural habitats is highlighted as a fundamental activity providing important information for efficient realization of nature protection [Schmeller 2008]. The critically endangered ones, both in terms of the continent and of Poland, include semi-natural meadow ecosystems. Intensification in agriculture and abandoning less productive types of meadows result, among other processes, in the succession of trees and shrubs with a simultaneous decrease in floristic diversity and disappearance of many protected and endangered species [Balátová-Tuláčková 1985, Huhta *et al*. 2001, Huhta and Rautio 2005, Poschlod *et al.* 2005, Michalska-Hejduk and Kopeć 2012a]. The most naturally valuable habitats include extensively utilized meadows of various moisture level, on which there develop phytocenoses from the *Molinion caeruleae* alliance. In Poland, over the past few decades, their diminishing is observed [Kornaś and Dubiel 1990, Barabasz 1994, Denisiuk *et al*. 1995, Kucharski 1999, 2009, Brzeg and Wojterska 2001, Michalska-Hejduk 2001, Barabasz-Krasny 2002, Kącki 2007]. In some regions of Poland, additional factors affecting transformation of habitats and plant cover are intensive industrialization and urbanization. These areas include most of the Silesian Upland (south Poland). However, despite heavy degradation of natural environment occurring for ages, there are some vegetation enclaves which are relatively well developed in terms of phytocenosis, also including meadow communities. However, they were not the subject of a complex study. Data occurring in literature is often general or concerns only some regions, selected types of meadows or occurrence of protected and rare species in meadow communities [Ciepał and Jędrzejko 1977, Babczyńska-Sendek *et al*. 1994, Babczyńska-Sendek 1998, 2009, Bernacki and Nowak 1994, Nowak and Bernacki 1997, Tokarska-Guzik 1997, Zalewska 1997, Bula and Nowak 2000, Czylok and Baryła 2003, Malewski 2006, Suder 2008, Babczyńska--Sendek and Henel 2009, Tokarska-Guzik *et al*. 2012b]. Even such fragmentary documentation confirms unique abundance and floristic diversity of meadows occurring here in the past. In the industrial landscape of the Upper Silesia (the southeastern part of the historical and geographical region of Silesia), meadow communities have mosaic distribution and usually cover small areas. Especially in such degraded areas these are valuable centers of biodiversity, which should be under special protection.

In 2008, parts of meadows of the best preserved structure were suggested to be included in the protection as Natura 2000 areas. In the present study, special attention has been paid to two of them located on urban areas: "Meadows in Jaworzno" and "Meadows in Slawków". One of the types of natural habitats protected here are *Molinia* meadows from the order *Molinion caeruleae* (code 6410), and they are the main subject of this study.

The main aims of the study included presentation of the current diversity of the analyzed type of meadow communities, preliminary assessment of their conservation status, as well as determination of the most important floristic assets, as well as indicating trends in management on areas of the studied protected localities.

MATERIAL AND METHODS

The research included meadows of two Natura 2000 areas: "Meadows in Jaworzno" and "Meadows in Sławków". According to physical and geographical division they are located in the Silesian Upland [Kondracki 2009], in two towns, at the eastern border of the Upper Silesia, in the central part of the Silesian Voivodeship. The area of "Meadows in Jaworzno" (50°12′ N; 19°19′ E) consists of 4 parts of the total area of 36.45 ha [http://natura2000.gdos.gov.pl/datafiles] situated in the district of Ciężkowice, in the north-eastern part of town. The area of "Meadows in Sławków" (50°18′ N; 19°20′ E) covers 3 parts of a total area of 50.97 ha [http://natura2000.gdos. gov.pl/datafiles], located in the following districts: Ciołkowizna, Kozioł and Korzeniec, in the central part of town. On each of the mentioned areas, only their small parts are still utilized in agriculture, no mowing nor grazing has been conducted on majority of these areas for at least 10 years. However, burning of meadows can observed there in spring. Moreover, in the neighboring areas, a progressing single-detached dwelling is observed along with an accompanying infrastructure.

Field studies were carried out in July 2012. Based on the observations conducted on the whole area of the analyzed localities, borders of the occurrence of the analyzed habitat were established on these areas. In order to determine phytosociological diversity of the habitats from the *Molinion caeruleae* alliance, as well as its current conservation status and threats, some elements of methodology were applied to monitor species and habitats of Natura 2000 [Kącki and Załuski 2004, Michalska-Hejduk and Kopeć 2012b]. In localities where the authors considered *Molinion coeruleae* patches as developed in a representative way for particular areas, the following research areas were designated: 4 in case of "Meadows in Jaworzno" (J I-J IV) and 3 in case of "Meadows in Sławków" (S I-S III). They were designated arbitrarily, taking into consideration, among other things, habitat diversity and current stage of ecological transformations. In three cases (the area J I and J III as well as S III) they had a form of a transect of 10 m × 200 m, in other cases they had a different shape, though they maintained a similar size, i.e. 2000 m^2. Within each of the areas, in the typically developed habitat patches, 3 phytosociological relevés were taken in each case with Braun-Blanquet method of an area of 100 m^2. If possible they were located in a similar distance from each other. In case of transects, efforts were made to localize relevés at the beginning, in the middle and at the end of it. Geographical coordinates of their centers were given for each of them. In total, 21 relevés were taken (12 for "Meadows in Jaworzno" and 9 for "Meadows in Sławków") and they were juxtaposed in a phytosociological table determining diversity of their vegetation communities. Nomenclature of plant species was adopted based on the up-to-date study [Mirek *et al*. 2002], while taxonomy and nomenclature of communities according to Matuszkiewicz [2008]. Within the whole research areas, some selected parameters of natural habitat were evaluated [Michalska--Hejduk and Kopeć 2012b]: (i) typical species, i.e. characteristic and differential for the *Molinion caeruleae* alliance [Matuszkiewicz 2008], (ii) invasive alien species [Tokarska-Guzik *et al*. 2012a], (iii) expansive species of herbaceous plants, (iv) expansion of shrubs and saplings. All these parameters were used to determine conservation status of the studied natural habitat, and to indicate threats to it. Evaluation of flora was carried out based on the list of protected species in Poland (Regulation of the Ministry of Environment of 9 October 2014) as well as on "The red list of vascular plants of Silesian Voivodeship" [Parusel and Urbisz 2012]. Moreover, abundance of

population was estimated for these species. Depending on the type of growth of particular species, either the area that they covered was given, or the shoots were counted (data exclusively for generative shoots). In case of counting, precise resources are given for species having up to 30 shoots. However, for others, they were estimated while determining first the total area taken, and then multiplying it by the number of shoots on the randomly selected 1 m^2.

RESULTS AND DISCUSSION

Conducted field experiments confirmed compliance of the current proportion of area of the studied natural habitat with the one given in the documentation of both analyzed Natura 2000 areas [http://natura2000.gdos.gov.pl/datafiles]. In case of "Meadows in Jaworzno", *Molinia* meadows covered app. 60% of the area, while on the area of "Meadows in Sławków" their proportion was significantly lower, app. 15%.

Despite a small area of the analyzed localities and strong pressure on the side of human, communities on the meadows from the *Molinion caerulae* alliance are quite diversified (Table 1) and present significant floristic and phytocenotic assets. They may be classified as the *Galio veri-Molinietum* and the *Selino carvifoliae-Molinietum caerulae* association. Moreover, small part of communities developed fragmentarily with a slight proportion of species characteristic for the association. More often and more abundantly represented there are species from the *Molinion caeruleae* alliance and from the order *Molinietalia.*Among them there are: *Deschampsia caespitosa*, *Molinia caerulea*, *Sanguisorba officinalis* and *Angelica sylvestris.* In impoverished phytocenoses, the dominant species are often: *Rubus caesius* (with coverage sometimes reaching 80%), *Calamagrostis epigejos* and *Solidago canadensis*. Patches of the association *Galio veri-Molinietum*, for the first time described by Kącki [2007], developed on drier parts of meadows with an organic bedding containing calcium carbonate, characterized by a significant proportion of thermophilous species. Communities of a similar character, namely *Galio borealis-Molinietum*, are given for Greater Poland [Brzeg and Wojterska 2001], while in the Silesian Upland they were observed in Dąbrowa Górnicza and Trzebyczka [Suder 2008]. Phytocenoses from this area were floristically abundant, on average there occurred 45 species per relevé (from 24 to 65). Moreover, occurrence of 10 protected species was observed on them, and 8 species considered as rare. Patches of associations on the studied Natura 2000 areas do not indicate such floristic diversity. From 20 to 42 species were observed there, on average app. 30 species per relevé (Table 1), which in turn makes them closer to the mean value for phytocenoses of the association for Poland [Kącki 2012]. In total, in the patches of the discussed communities, occurrence of 138 species of vascular plants was observed. Apart from characteristic and determining species for the association such as *Galium boreale* (at significant cover), *Betonica officinalis*, *Serratula tinctoria, Inula salicina, Silaum silaus, Galium verum* in analysed patches *Dianthus deltoides, Genista tinctoria, Knautia arvensis, Libanotis pyrenaica, Thymus pulegioides* were recorded. In the area studied, the meadows are often located in close proximity to xerothermic grasslands and thermophilous fringes from where thermophilous plant species can penetrate into the meadow communities. Another characteristic trait of this community is the dominance of dicotyledonous over monocotyledonous plants including grasses, which confirmed the observation of other authors [Suder 2008, Kącki 2012].

Also occurrence of phytocenoses of *Selino carvifoliae-Molinietum caeruleae* was observed. On the studied areas, the most numerous and most frequent characteristic species of this association is *Selinum carvifolia*, while of the differential one: *Carex panicea.* Moreover, there occur: *Iris sibirica*, *Carex acutiformis*, *Gentiana pneumonanthe* and *Laserpitium prutenicum*. The latter species was observed on the area of "Meadows in Jaworzno" for the first time. It belongs to the rarest elements of vascular plant flora in the Silesian Upland. Significant proportion, greater than in case of the previous association, had species from the order *Arrhenatheretalia* and class *Molinio--Arrhenatheretea*, including representatives of the family Poaceae: *Deschampsia caespitosa*, *Arrhenatherum elatius*, *Holcus lanatus*, *Phleum pratense*. Greater coverage than in the previously described communities was also achieved here by *Molinia caerulea*. Number of species per relevé oscillated from 25 to 35, being on average 30. These values are similar to the ones given for the eastern part of the Silesian Upland: 22, 47 and 33 [Suder 2008], respectively, as well as for other regions in Poland: on average 34 species per relevé [Kącki 2012]. Patches of this community were observed mainly on the lower parts of the terrain, with a higher level of groundwater, and their physiognomy had a valley-tussock structure, mainly because of quite numerously occurring *Molinia caerulaea* and *Deschampsia caespitosa*.

While analyzing the basic parameter of the conservation status of a natural habitat, i.e. occurrence of typical species (characteristic of the *Molinion caeruleae* alliance), it was found that on each of the analyzed areas, there were observed 10 out of 15 such species [Matuszkiewicz 2008]. *Laserpitium prutenicum* was observed only in Jaworzno. Another characteristic species, *Carex tomentosa,* although occurred on meadows in Sławków, it was outside the analyzed areas. Compared with the described patches of meadows from other parts of the Silesian Upland [Suder 2008, Babczyńska-Sendek and Henel 2009], the number of typical species in the analyzed phytocenoses was slightly lower. However, except *Molnia caerulea*, sometimes *Galium boreale* and *Serratula tinctoria*, they occurred here in lower numbers.

Other parameters of the conservation status are: presence of invasive alien species and expansion of trees and shrubs. In the analyzed patches 3 species of invasive plants of American origin were observed. These are: *Solidago canadensis*, *Padus serotina* and *Quercus rubra*. Their proportion was insignificant, they did not reach 5% of coverage on the analyzed areas. Apart from the two latter species on meadows there were also observed other species of trees and shrubs of different age: from seedlings to a few--year-old plants. These were: *Rubus caesius*, *Crataegus monogyna*, *Frangula alnus*, *Corylus avellana*, *Cornus sanguinea*, *Viburnum opulus*, *Betula pendula*, and *Tilia cordata.* Their total coverage also did not reach 5%. The symptom of the occurring secondary succession of vegetation connected with abandoning utilization may also be presence of herbaceous species such as: *Filipendula ulmaria*, *Lysimachia vulgaris*, *Valeriana officinalis*, as well as other herbaceous species like: *Calamagrostis epigejos*, *Cirsium arvense*, *Phragmites australis,* covering usually up to 20%.

Conservation status of the described patches of meadows may be considered, in the period of observation, as good (appropriate). However, visible symptoms indicate change in this assessment in a short time, unless particular actions are taken.

Table 1. Meadow communities recorded on chosen Natura 2000 areas in the eastern part of the Silesian Upland
Tabela 1. Zbiorowiska łąkowe odnotowane na terenach wybranych obszarów Natura 2000 wschodniej części Wyżyny Śląskiej

Succesive number Numer porządkowy	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Constancy – Stałość	Cover coefficient – Współczynnik pokrycia
Field number of relevé – Numer zdjęcia w terenie	10	11	15	13	9	7	17	12	18	14	8	2	1	20	3	21	19	16	6	5	4		
Locality Stanowisko	J IV 1	J IV 2	S I 3	S I 1	J III 3	J III 1	S II 2	J IV 3	S II 3	S I 2	J III 2	J I 2	J I 1	S III 2	J I 3	S III 3	S III 1	S II 1	J II 3	J II 2	J II 1		
Date of relevé Data	27.07 2012	27.07 2012	03.08 2012	03.08 2012	27.07 2012	27.07 2012	03.08 2012	27.07 2012	03.08 2012	03.08 2012	27.07 2012	27.07 2012	27.07 2012	03.08 2012	27.07 2012	03.08 2012	03.08 2012	03.08 2012	27.07 2012	27.07 2012	27.07 2012		
Cover of shrub layer b Pokrycie warstwy krzewów b, %	3	3	2	–	10	–	10	3	2	1	10	3	5	1	–	1	2	5	–	1	5		
Cover of herb layer c Pokrycie warstwy zielnej c, %	95	100	95	100	100	95	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
Cover of moss layer d Pokrycie warstwy mchów d, %	–	5	5	5	–	–	5	–	–	5	5	10	5	10	10	5	–	5	5	20	–		
Species number in relevé – Liczba gatunków w zdjęciu	30	30	26	42	27	24	20	29	30	39	25	30	31	29	28	25	35	24	21	27	23		
Ch. Ass. et D.* Galio veri-Molinietum																							
Galium boreale	2	2	3	3	1	1	2	2	2	1	1	3	3	.	.	.	.	+	.	1	.	IV	1250
Betonica officinalis	3	2	2	1	2	2	2	2	1			1			1				1	1	+	IV	822
Gladiolus imbricatus	+	1	r	+	1	r	2	2	.	.	1	.	.	.	.	.	.	2	r	.	.	III	324
Serratula tinctoria	1	2	4	.	3	4	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	II	513
*Galium verum**	.	.	.	1	.	.	+	1	1	+	.	.	.	.	.	.	.	.	.	.	.	II	73
Inula salicina 2 (1, 2), *Silaum silaus* + (8), 1 (3), 2 (10), 3 (4)																							
Ch. Ass. et D.* Selino carvifoliae-Molinietum caeruleae																							
Selinum carvifolia	3	2	+	+	2	+	.	+	2	+	2	3	3	3	2	2	2	+	.	+	+	V	1300
*Carex panicea**	.	.	.	+	.	.	.	+	.	.	3	.	2	1	.	2	1	2	.	+	.	III	478
Iris sibirica	.	1	2	.	.	.	3	2	.	+	.	2	.	.	2	.	.	.	2	.	.	II	619
*Carex acutiformis** 1 (12, 19), *Gentiana pneumonanthe* + (9), 1 (1, 6), *Laserpitium prutenicum* + (4, 10), 2 (11)																							

Table 1 continued – cd. tabeli 1

Ch. All. et D.* Molinion caeruleae																								
Molinia caerulea	3	2	2	2	3	3	3	2	2	3	4	2	3	3	.	4	3	4	3	+	+	V	3001
Succisa pratensis	2	1	.	3	.	1	.	1	2		r	+	1	2	.	.	.	1	.	.	2	III	632
*Potentilla erecta**	2	.	.	.	r	.	.	.	2	+	+	.	1	1	1	.	.	1	.	+	.	III	264
Salix repens subsp. *rosmarinifolia** c	1	.	+	.	2	.	2	.	.	.	.	.	.	+	.	.	+	.	.	.	.	II	192
*Briza media** + (1), 1 (2, 4), 2 (14), *Carex flava** + (1), *Parnassia palustris** + (4, 10), *Pimpinella saxifraga** + (6)																								
Ch. All. Filipendulion																								
Filipendula ulmaria	.	+	2		3	1	1	.	+	.	.	1	.	.	.	+	+	1	.	3	.	III	538
Lysimachia vulgaris	.	+	2	1	2	1	.	.		2	+			1		.	1		1	.	.	III	370
Valeriana officinalis	.	2	+				2	1	1			+	1	+	3	+	.	.	.	+	1	III	369
Hypericum tetrapterum	+	.	.	.	.	+	.	.	.	.	2	.	.	.	.	1	.	.	.	.	+	II	109
Lythrum salicaria	.	.	.	.	.	+	.	.	.	+	.	.	.	+	.	1	+	.	.	.	.	II	26
Geranium palustre + (19), *Stachys palustris* + (2), *Thalictrum lucidum* + (18)																								
Ch All. et D.* Calthion																								
Cirsium rivulare	.	1	2	3	1	2	3	.	.	2	2	4	3	2	2	1	.	1	.	2	.	IV	1522
Polygonum bistorta	.	.	.	.	.	2	.	.	.	.	.	2	+	.	3	.	.	.	2	3	1	II	631
Caltha palustris + (2), 2 (6), *Cirsium oleraceum* + (14), 1 (16), *Geum rivale** + (11, 14, 16), 1 (13), *Juncus conglomeratus* + (17), 1 (14), *J. effusus* + (17), 1 (14)																								
Ch. O. Molinietalia																								
Sanguisorba officinalis	1	1	3	1	2	2	3		3	3	2	3	3	2	2	3	2	.	1		2	V	1929
Deschampsia caespitosa	.	1	1	2	1	.	1	1	3	1	1	2	2	3	3	2	2	.	2	2	1	V	1310
Angelica sylvestris	+	+	+	2	+	.	.	.	1	1	.	2	2		+	+	.	2	.	3	2	IV	646
Lotus uliginosus	.	.	.	1	+	.	+	.	.	.	.	.	1	1	1	.	1	1	.	.	.	II	144
Equisetum palustre	.	.	.	2	+	.	1	+	.	1	.	.	.	.	.	.	.	.	.	.	.	II	132
Galium uliginosum	.	.	.	.	1	.	.	.	.	.	1	.	.	+	.	1	1	1	.	.	.	II	120
Colchicum autumnale	+	.	+	1	.	.	.	1	+	.	+	.	.	.	.	.	.	.	1	1	.	II	97
Cirsium palustre + (1, 8), 2 (14, 17), *Galium mollugo* 1 (17), 2 (9, 16), *Lychnis flos-cuculi* r (8), *Poa angustifolia* + (8, 12, 17), 2 (14)																								
Ch. O. Arrhenatheretalia																								
Arrhenatherum elatius	.	.	.	.	+	.	.	.	.	+	.	2	3	.	2	.	+	.	2	1	.	II	454
Achillea millefolium	.	.	.	1	.	.	.	.	1	1	+	.	.	+	.	1	.	1	.	.	.	II	120
Dactylis glomerata	.	.	.	1	.	.	.	.	.	1	.	.	1	.	.	.	.	.	+	.	r	II	72
Centaurea oxylepis	.	.	.	.	.	.	.	+	.	.	+	+	.	.	.	.	+	+	.	+	.	II	3
Carum carvi + (6, 20), 1 (2), 2 (13), *Crepis biennis* r (9, 21), + (14), *Daucus carota* r (15), *Heracleum sphondylium* + (13, 16, 20), *Juncus inflexus* 1 (4), *Knautia arvensis* 1(4), *Leucanthemum vulgare* + (8), *Lotus corniculatus* + (7), *Lysimachia nummularia* + (2, 15)																								

Table 1 continued – cd. tabeli 1

Ch Cl. Molinio-Arrhenatheretea																										
Carex hirta	1	+	+		+	2		1	2	1		2	+		2			1				2			IV	514
Centaurea jacea	1	+	+	+	1	+		+	2	2	+						2	2	1						IV	408
Lathyrus pratensis			+	1		1				+	+	2	2		2			1		r	2	1			III	430
Holcus lanatus	1			1						+		1	2	1	1	+	1	1				+			III	251
Vicia cracca	+	+		+	r					1	+	+	+					1				1			III	75
Phleum pratense				+						+		1	r		2						1				II	132
Ranunculus acris			+	1				+		+		1	r		+	r									II	50
Agrostis gigantea								+	+		+								1	r					II	26
Alopecurus pratensis + (1), *Cerastium holosteoides* + (10), *Leontodon hispidus* + (18), *Plantago lanceolata* r (17), + (14), 1 (4, 10), *Mentha longifolia* 1 (4), *Potentilla anserina* + (16), 1 (4), *Poa pratensis* 1 (15, 17), 2 (9), *Prunella vulgaris* r (1, 17), *Ranunculus repens* (14, 16, 17), *Rumex acetosa* r (15, 17), + (10), 1 (16)																										
Accompanying species– Gatunki towarzyszące																										
Solidago canadensis		1	+		2	+		1	1	1		1	3	+				+				2	2		IV	550
Calamagrostis epigejos						r		2			2											3	2		II	429
Galium vernum	2		1	1	+		+			1															II	156
Equisetum arvense	1	+			+				+	1		+	r		+										II	50
Stellaria graminea				+							+			+			1	1	+						II	50
Quercus robur c		+			+													+		+	+	+			II	3
Aegopodium podagraria + (19), *Agrimonia eupatoria* + (2), *Ajuga reptans* r (15), *Alchemilla glabra* 1 (4, 10), *Alnus glutinosa* + (20), *Betula pendula* 2 (11), *Carex canescens* 1 (9), *C. flacca* r (13), 1 (3, 4, 10), *C. nigra* 1 (17), *Cirsium arvense* r (2), + (13), 1 (12, 17), *Cornus sanguinea* c + (12), 1 (18, 21), *Coronilla varia* + (18), *Corylus avellana* c + (2, 8, 12), *Crataegus monogyna* c + (1), 1 (8), *Dianthus deltoides* + (3), *Epilobium hirsutum* + (12, 15), *Epipactis palustris* 1 (4, 10), *Euonymus europaea* c + (15), *Eupatorium cannabinum* + (6), *Fallopia convolvulus* + (10), *Frangula alnus* c + (11, 16), 1 (15), *Galeopsis tetrahit* r (15, 20), + (13, 19), *Galium aparine* + (21), 1 (15), *Genista tinctoria* + (1), *Hypericum maculatum* 1 (5), *Libanotis pyrenaica* 1 (6), *Listera ovata* + (4), *Luzula multiflora* + (7), *Mentha arvensis* + (10, 17), *Ononis arvensis* r (1), + (9), 2 (4), *Padus serotina* c r (14), + (9, 10, 17), 1 (13), *Peucedanum cervaria* 1 (8), *Phragmites australis* + (2, 4), 1 (6), 2 (5), *Polygonum amphibium* + (3), *Prunus spinosa* c + (9), *Quercus rubra* c r (19), *Rhamnus cathartica* c + (5), *Rubus caesius* 1 (17), 2 (16), 3 (20), 4 (19), 5 (21), *Rumex obtusifolius* + (12), *Scrophularia nodosa* r (19), *Thymus pulegiodes* + (7), *Tilia cordata* c + (2), 1 (21), *Tussilago farfara* + (4), *Urtica dioica* r (15), 1 (4), *Viburnum opulus* c + (1), 1 (13, 21)																											

abbreviations – objaśnienia skrótów: J – Jaworzno, S – Sławków, I, II, II, IV – successive number of transects studied – numer kolejny analizowanego transektu, 1, 2, 3 – number of relevé taken within transect – numer zdjęcia w transekcie

The studied areas are also characterized by great floristic assets. A particular asset here is presence of 5 strictly protected species: *Epipactis palustris*, *Gentiana pneumonanthe*, *Gladiolus imbricatus*, *Gymnadenia conopsea* subsp. *conopsea*, *Iris sibirica*, as well as 4 species under partial protection: *Centaurium erythraea* subsp. *erythraea*, *Colchicum autumnale*, *Listera ovata* and *Phyteuma orbiculare.* The latter species represents the mountain element in the flora of the Polish lowlands and belongs to a very rare species (2 localities) in the Silesian Upland [Tokarska-Guzik 1997, Nowak 1999]. Most of the mentioned species in the growing season 2012 were represented quite numerously (Table 2). Moreover, outside the patches of the discussed communities, occurrence of two more species was observed under strict protection: *Liparis loeselii*, *Orchis morio*, and two under partial protection: *Dactylorhiza majalis* and *Pedicularis palustris*. In addition, 16 from the observed plant species (including 7 among the protected ones) have been classified as the endangered ones in the Silesian Voivodeship [Parusel and Urbisz 2012] (Table 2). *Laserpitium prutenicum* belongs to the particularly valuable ones in this group and it got category CR (critically endangered).

Table 2. Species threatened and protected by law recorded in the areas studied
Tabela 2. Gatunki zagrożone i prawnie chronione odnotowane na badanych obszarach

Taxon name Nazwa taksonu	Protection by law Ochrona prawna	Cathegories of threat Kategorie zagrożenia	Abundance/size of population Liczebność/wielkość populacji	
			„Meadows in Jaworzno" „Łąki w Jaworznie"	„Meadows in Sławków" „Łąki w Sławkowie"
Centaurium erythraea subsp. *erythraea*	§	–	*15	20
Colchicum autumnale	§	VU	300	500
Epipactis palustris	§§	NT	50	100
Equisetum pratense	–	LC	**5 m^2	1 m^2
Gentiana pneumonanthe	§§	VU	200	400
Gladiolus imbricatus	§§	NT	400	200
Gymnadenia conopsea subsp. *conopsea*	§§	NT	–	15
Inula salicina	–	VU	25 m^2	–
Iris sibirica	§§	VU	20 m^2	15 m^2
Laserpitium prutenicum	–	CR	800	
Listera ovata	§	LC	50	80
Parnassia palustris	–	NT	30	20
Phyteuma orbiculare				
Serratula tinctoria	–	NT	40 m^2	50 m^2
Silaum silaus	–	VU	100 m^2	80 m^2
Thalictrum flavum	–	VU	2 m^2	-
Thalictrum lucidum	–	NT	5 m^2	10 m^2

§§ – strictly protected species – gatunki ściśle chronione, § – partly protected species (according to the Regulation of the Ministry of Environment [2014]) – gatunki częściowo chronione (zgodnie z Rozporządzeniem Ministra Środowiska [2014])

cathegories of threat in the Silesian Voivodeship (according to Parusel and Urbisz [2012]) – kategorie zagrożenia w województwie śląskim (zgodnie z opracowaniem Parusel i Urbisz [2012]): CR – critically endangered – krytycznie zagrożony, VU – vulnerable – narażony, LC – least concern – najmniejszej troski, NT – near of threat – bliski zagrożenia

* number of flowering shoots – liczba pędów kwitnących, ** total area of clump-forming plant species – całkowita powierzchnia zajmowana przez gatunki o wzroście kępowym

According to Kącki [2012], development of particular types of communities on *Molinia* meadows and their conservation, beside habitat conditions is also affected by the method of agricultural management. Mowing, poorly tolerated by *Molinia caerulea*, reduces its occurrence, while grazing is favorable for the development of dicotyledonous plant species. A similar balance was observed in the analyzed areas. Interactions resulting from natural or anthropogenic processes threaten preservation of *Molinia* meadows in the appropriate condition [Załuski 2007, 2011, Kącki 2012, Michalska-Hejduk and Kopeć 2012b]. Based on the conducted observations, threats from both these categories have been identified. Apart from native species, both herbaceous and woody ones mentioned above, among plants entering meadow communities there were observed the following invasive species of North American origin: *Padus serotina*, *Quercus rubra*, and *Solidago canadensis*. These processes are more visible on the area of „Meadows in Jaworzno". On the other hand, main anthropogenic factors threatening the described phytocenoses are: the cessation of mowing and grazing, improvement in drainage, periodic burning off, expansion of urbanisation, proximity of many communication routes together with the presence of the ditches accompanying them and the devastation of land by cross-country vehicles. Influence of this group of factors is more visible on „Meadows in Sławków".

CONCLUSIONS

1. Floristic and phytocenotic assets of the discussed Natura 2000 areas fully justify bringing these forms of nature protection into existence, especially in the aspect of preserving them in the form relatively slightly transformed on urban areas.
2. Protection of the characterized areas will contribute to preservation of local diversity, enabling at the same time conservation of genetic resources of many rare and protected species of vascular plants.
3. There is a real possibility to protect designated habitats through active treatments and reduction in external factors, e.g. building development.
4. To preserve characteristic structure of the analyzed meadows, it is recommended to mow them in late summer, once a year or once every two years, which should be included in the plan of protection tasks.
5. It is necessary to monitor the analyzed natural habitat in order to determine tendencies of changes, which will help modify methods of its management.

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WALORY I ZAGROŻENIA ZMIENNOWILGOTNYCH ŁĄK TRZĘŚLICOWYCH (ZWIĄZEK *Molinion caeruleae*) NA TERENACH WYBRANYCH OBSZARÓW NATURA 2000 WSCHODNIEJ CZĘŚCI WYŻYNY ŚLĄSKIEJ

Streszczenie. Badania zróżnicowania i stanu zachowania zmiennowilgotnych łąk trzęślicowych jako istotnie zagrożonych siedlisk przyrodniczych są bardzo ważne w kontekście ochrony przyrody w skali Europy. Zebrane dane podstawowe dla przykładowych obiektów chronionych na Wyżynie Śląskiej, których głównym przedmiotem ochrony jest wymienione siedlisko przyrodnicze, dają podstawę do kontynuowania monitoringu i wysnuwania wniosków dotyczących ich ochrony. Było to głównym celem podjętych

badań. Na analizowanych obszarach odnotowano występowanie płatów zespołu *Galio veri-Molinietum* i *Selino carvifoliae-Molinietum caeruleae* ze związku *Molinion caeruleae*. Do najważniejszych walorów florystycznych tych obszarów należy obecność 5 gatunków roślin objętych ochroną ścisłą o znacznej liczebności oraz występowanie *Laserpitium prutenicum*, uznanego za krytycznie zagrożony na terenie województwa śląskiego. Zbiorowiska na terenie projektowanego obszaru Natura 2000 „Łąki w Jaworznie" zagrożone są przede wszystkim przez procesy naturalne (sukcesja roślinności), natomiast na obszarze „Łąki w Sławkowie" – przez działania człowieka związane z melioracją i zabudową oraz dewastację terenu przez pojazdy terenowe. Podkreślono znaczenie proponowanych do ochrony obszarów dla zachowania cennych układów fitocenotycznych, szczególnie w aspekcie ich lokalizacji na terenach miejskich.

Key words: „Łąki w Jaworznie", „Łąki w Sławkowie", roślinność nieleśna, województwo śląskie, zagrożone siedliska, zbiorowiska łąkowe

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